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ORIGINAL ARTICLES

DEEP X-RAY THERAPY*

Its Development and Present Status

By Isaac Gerber, M.D.

AND

Simon Albert, M.D.

Providence, R. I.

It is our purpose in this paper to counteract some of the misconceptions regarding deep x-ray therapy which exist in the minds of many physicians. These misconceptions have impeded the progress of radiologists and have frequently been responsible for preventing the beneficial application of treatment to some patients. This lack of whole-hearted support on the part of the medical profession is partly due to the bewildering confusion through which our present attitude toward deep therapy has developed.

The term *"deep* x-ray therapy" is used to designate the application of x-rays produced by tube voltages over 100,000, more especially those in the vicinity of 200,000. The term *"superficial* therapy" is used to designate the application of x-rays produced by voltages under 100,000. Treatment with 200,000 volts is spoken of also as High-Voltage treatment, while the use of voltages under 100,000 is spoken of sometimes as Low-Voltage treatment. High voltages produce rays of shorter wave length and hence high-voltage treatment is also spoken of as Short-Wave-Length treatment in contradistinction to the Long-Wave-Length treatment in low voltages.

As a matter of fact, ever since radiologists have been treating deep lying pathology they have been doing "deep therapy." This has been a matter of at least twenty years. The rays of short wavelength, however, are much more penetrating and the newer technique of application allows us to deliver more effective doses than formerly. We are able to produce destructive doses in the depths much more easily and without necessarily producing a dermatitis. This was a continual handicap with the use of low-voltage apparatus.

About ten years ago so-called modern deep therapy with voltages around 200,000 was first introduced by the Germans, particularly the gynecologists. It is now questionable as to whether or not their apparatus was actually able to deliver the high voltages they claimed. Their x-ray tubes were capable of taking only about 180,000 volts with 2 to 2½ milliamperes. Apparatus has since then developed so that today machines can deliver 300,000 volts if necessary and water-cooled tubes will take 250,000 volts and 50 milliamperes with continuous operation.

The therapeutic application of x-rays has had a stormy career since the early enthusiasm of radiologists back in 1905. This initial wave of enthusiasm was promptly followed by a wave of depression resulting from a realization of the possible harmful effects of improper radiation. The period of depression was followed by a long, slow struggle to overcome prejudice and get radiation therapy back to a sensible basis. Dosimeters were introduced to measure the intensity and the quality of rays and various other steps were taken to insure the avoidance of possible injury to the patient.

The publication of some of the results of the application of high-voltage x-rays to deep seated malignant disease about six years ago aroused an enthusiasm similar to that which broke forth in 1905. It was only a short time, however, before reports of serious harm began to come in from various sources. These reports changed the enthusiasm of our radiologists into a fairly long-enduring skepticism. Most of them listened, some of them visited the different European clinics, but few attempted to bring the status of deep therapy back to a rational basis.

Today there are very few radiologists who will not readily admit that high-voltage x-rays can produce beneficial results which were impossible of achievement by former low-voltage methods.

*Read before the Rhode Island Medical Society, December, 1925.

The successful application of high-voltage x-rays, however, has proved to be far more difficult than was at first realized. Cellular structure is apparently more sensitive to short wave, high-voltage, deep therapy than to long wave, low-voltage, superficial therapy. The two wave lengths are to be regarded as essentially different therapeutic agents. The true explanation of this difference in cellular response to the various wave lengths has not yet been definitely demonstrated.

Most of the early work on deep therapy was done in 1920 and 1921. At this stage there was no such thing as a status of deep therapy. Everything was chaotic. Most of the Germans were in agreement on the necessity of having apparatus able to deliver at least 200,000 volts and the necessity of employing heavy filters to cut out all long wave lengths which were of low penetrating value. There was the greatest possible divergence of opinion on all vital questions of technique. Some insisted on large fields and long distances in order to get the benefit of a larger proportion of depth dosage, and a greater amount of deep scattered rays. Others insisted on concentration with compression to get nearer the pathology. Some insisted on applying the entire dosage within one or two days, while others divided it over a week's period. Others used four weekly doses. Some wanted a slight erythema. Others insisted on a severe skin reaction. Some wanted to repeat the erythema dose in six to eight weeks, while others maintained that it must not be repeated in under six months. Everyone held that the prime object of the radiation was to deliver a death-dealing dose to the cancer and they all brought forth plausible arguments in their favor.

In the high-voltage treatment of malignancy, Seitz and Wintz were the first to establish a so-called "carcinoma dose" and a "sarcoma dose." The existence of any such rule-of-thumb dosage has since been denied by numerous investigators, particularly by the Americans and the French. Carcinomata respond to high-voltage x-ray therapy in vastly different ways dependent upon their morphological, histological and genetic differences. Thus, uterine and breast cancers in general, respond much more favorably than do gastric and colonic cancers. Primary growths also respond much better than secondary metastatic growths.

Sarcoma dosage perhaps is still more complex than carcinoma dosage. The so-called "sarcoma dose" of Seitz and Wintz does not apply to bone sarcoma or giant-cell sarcoma. It does hold for small round cell sarcomata and the group of lymphatic system sarcomata. Periosteal and endosteal sarcomata are not very amenable to a uniform sarcoma dose. The same is true of melanotic sarcoma. Sometimes we see apparently identical types of sarcomata react very differently to the same irradiation.

One of the most interesting phases in the development of the dosage technique was concerned with the question of whether to administer large massive doses within a very short period of time or whether to split the total dose up into moderately small fractions and administer them over a period of a week or two. The massive doses were advocated by the Germans. Most of the Americans were inclined toward the moderate doses which were far less prostrating and proved just as efficacious, if not more so, than the massive applications. The French sponsored a third method which even today is considered by a good many radiologists as offering more hope than the others.

The French technique has been advocated chiefly by Prof. Claude Regaud, Director of the Radium Institute of the University of Paris. A very plausible argument is advanced in his support. It is admitted that cellular structure is most sensitive to radiation during the period of cell division. In a given mass of cancer tissue, cell division is going on over a long interval of time. At any one given time, only a relatively few cells are in the actual process of division. These are the ones most apt to show a response to the radiation. Those not radiated during the period of cell division may be entirely unaffected by the rays. On this basis, if minute doses are given every day or even twice a day over long periods of time, the chances are that most of the cancer cells will be irradiated during their cycle of cell-division. This prolonged treatment can be done easily without overlapping the bounds of safety. It offers something which today is attracting the serious attention of radiologists. It is very possible that it may soon supplant in at least some of our work, the technique hitherto employed.

All the foregoing discussion can be condensed into the following few statements:

1. High-voltage deep x-ray therapy has a value unquestionably superior to that of low-voltage therapy in the treatment of deep-seated pathology.
2. The two wave lengths are to be regarded as essentially different therapeutic agents.
3. There is no such thing as a cancer dose or a sarcoma dose.
4. There is no accepted technique of application of the high-voltage x-rays which is routine.
5. In a general way, the massive doses of the Germans have been given up.
6. The daily minute dosage advocated by the French is not yet wholly accepted but radiologists are still working on the problem.

Heavy treatment with x-rays constitutes only a single factor in the treatment of malignancy. We purposely omit discussion of Surgery and other physical agents such as Radium, Electro-desiccation and Coagulation. The ideal treatment of malignancy employs all these agents, alone or in combination, as the individual case requires. Our most satisfactory results are seen usually in those cases where we use combined methods. This is particularly true in cancer of the cervix. These cases lend themselves very favorably to a local radium application followed by a homogeneous general irradiation of the entire pelvic region by means of the high-voltage x-rays. The x-rays will manifoldly increase the value of the radium, more especially where the pathology shows an extensive invasion. Radium and high-voltage x-rays, however, do not replace each other as therapeutic measures. They both serve entirely different purposes.

In *General Surgery,* the application of deep x-ray therapy has been widespread in both benign and malignant conditions. Among benign surgical conditions, the method has proved of especial value in the treatment of mastitis and in the treatment of tuberculous bones and joints. If the diagnosis of mastitis can be established with any reasonable certainty, the conservative application of high-voltage x-rays to such a process will cause rather prompt and rapid subsidence of the pathology. In most cases, if the condition does not show signs of disappearing within a week or two, a more serious pathological condition should be suspected and treated accordingly. Meanwhile the delay is not dangerous as the treatment has a definite pre-operative value.

In chronic bone and joint tuberculosis we have frequently found that small doses of high-voltage x-rays given at three to four week intervals will facilitate a much more rapid improvement and convalescence. Considerable investigation along these lines has been carried on by German scientists. American radiologists, however, have not reported very much in the literature either in corroboration or in disapproval of the German reports. Personally, we have handled several obstinate cases of tuberculosis of the os-calcis which showed unquestionable clinical and roentgenographic improvement, both of which were completely absent for months and in one case for years, preceding the application of the x-rays.

Among the malignant conditions in the field of *General Surgery* we shall try to consider primary and metastatic cancers and sarcomas according to their regional distribution. In a general way, as previously stated, high-voltage x-rays are far more effective on the initial primary growth than upon any of its metastases. In far advanced conditions usually a temporary palliation is all that can be hoped for. Pain may be relieved. Foul, sloughing discharges may be abated or cleared up entirely. An improvement in the mental attitude of the patient may be stimulated by his feeling that something objectively is being done for the relief of his ailment.

In malignancy of the abdominal region, the stomach, colon, liver, pancreas, spleen, kidney, retro-peritoneal growths, etc., no general statements can be made. Cancers of the stomach, pancreas and liver, usually are not very responsive to deep therapy because the severe toxemia produced by direct radiation over the upper abdominal region interferes with the possiblity of getting sufficient x-rays into the malignancy to produce the desired effect. Lymphomatous growths of the abdominal region, however, show a decided response to small doses of x-rays. Splenic tumors are most frequently of the leukaemic types. These will be discussed later. Tumors of the kidney usually require large doses of x-ray, and palliative results are all that we can expect although palliation may sometimes last for several years.

In connection with the treatment of upper abdominal conditions we must consider the possible effect of the rays on the adrenal glands. In the early days of the use of high-voltage deep ther-

apy, radiologists continually dreaded the possibility of their causing irreparable damage to these organs with resulting Addison's disease. Since then experimental research has shown that this fear has very little real foundation.

Cancer of the breast offers one of the most valuable fields for deep x-ray therapy. It can be used advantageously before or after operation, or in inoperable cases. It will frequently change an inoperable cancer into an operable one. It will promote local healing of cancerous ulcers. It will relieve pain. It will effectively prevent or delay local recurrences.

In malignancies of the lungs and the mediastinum our results are very variable. Sometimes we can observe a marked palliation while at other times we see the patient progressively go down hill without evidence of the least benefit from the radiation. In the treatment of pulmonary and mediastinal malignancy we have come to use small doses repeated daily or every other day until our total dose is administered. The large doses which were administered in a few sittings during the early days of high-voltage therapy were found to be far too prostrating, thereby tending to counteract any possible benefits from the treatment.

In cancer of the esophagus the disadvantage of massive radiation over a very short interval was readily apparent. Obstruction and toxemia were increased, pain was often increased and death hastened. With cautious, small, frequent doses, obstruction usually can be temporarily relieved, the toxemia lessened, pain diminished and although life may not be actually prolonged any considerable period of time, it is made a good deal more comfortable until the termination.

In the benign *Gynecological* conditions, high-voltage therapy accomplishes its ends chiefly by the castration effect. X-ray castration, like a normal menopause, produces changes usually associated with ovarian non-function. There is a retrogression of myomata. There is a disappearance of hemorrhagic metropathies. It is also believed that x-ray castration will arrest the softening of bones in osteomalacia. The production of an artificial menopause is also of value in hastening the termination of a menopause which is causing prolonged distressing symptoms, particularly mental derangements. The ovaries are very sensitive to radiation. An attempt is made to stop the function of the follicles without impairing the general health of the patient. By distributing the castration dose over several treatments the climacteric symptoms usually can be greatly mitigated. It has been found that some types of uterine hemorrhage will entirely clear up after small doses of penetrating x-rays applied over the spleen.

In malignant *Gynecological* conditions high-voltage x-rays in combination with radium have given us perhaps our most satisfactory results. Seitz and Wintz in the Frauenklinik at Erlangen, developed the so-called small field applications, cross-firing through numerous small portals of entry concentrated upon the local pathology. Very shortly afterward, Dessauer and Warnekros, working upon the principle of utilizing scattered rays, developed the so-called large field method of therapy. This consisted chiefly in the treatment of uterine cancer through four large portals. For a time there was bitter controversy between these two schools of therapy. At the present time we have come to the conclusion that each method has its own value depending upon what is being treated and whether or not we desire a homogeneous or a focal application. The Seitz and Wintz method will give a local effect and is best employed in cases of well localized pathology. The Dessauer method will give a homogeneous effect and is more valuable in extensive pathology.

High-voltage deep x-ray therapy in the purely *Medical* field has been advantageously utilized in the various types of leukaemias and in the Hodgkins type of lymphoblastoma. It has also been of value in certain types of resistant bronchial asthma and chronic bronchitis.

In the various leukaemias the treatment is directed to the enlarged lymph-nodes or spleen and also to the bone marrow of the long bones. In the initial radiation the response is more prompt and more complete. In later radiations over the same regions there is a diminishing effect. Distress from abdominal distension, pressure from enlarged or overactive lymphoid structures and pains in the limbs, are temporarily relieved. As for actual prolongation of life, Minot's studies indicate there is no definite evidence to show that radiation does anything more than render the patient's existence more comfortable and symptom-free.

The same thing is usually true of the lymphoblastomata. The radiation will relieve symptoms more readily in the initial treatments. The later response becomes progressively less. Life is not actually prolonged but the relief of distressing symptoms makes the patient much more comfortable.

In asthmatic and chronic bronchitis cases which do not respond to the usual methods of treatment, the use of high-voltage x-rays offers a possibility of some relief. In favorable cases careful radiation will lessen the paroxysms and cough, diminish the amount of sputum and change the microscopical character of its constituent elements.

As for the future prospects of high-voltage deep therapy one finds it difficult to make any definite assertions. From what we have seen of it in its brief career of five or six years there is no question in our minds but that it is here to stay as one of the most valuable means for physical therapeusis which we have at our command.

FUNCTIONAL UTERINE HEMORRHAGE*

By George W. Waterman, M.D.

Mr. President and Members of the Providence Medical Association:—

This paper on Functional Uterine Hemorrhage which I am about to read is a somewhat modified and condensed edition of a paper which I read on this same subject before the staff of the Providence City Hospital in April of this year.

The term functional uterine hemorrhage is applied to a rather large group of cases of bleeding occurring during the reproductive period, which assumes considerable importance because of the quite large numbers of women afflicted, and because of the severity of symptoms which can arise as the result of the continued and often intractable loss of blood. This type of bleeding it not associated with any malignant or benign neoplastic process nor with obvious inflammatory or pregnant states.

History

These cases come to us with a history of bleeding which in the early case takes the form of a menorrhagia, i.e., profuse and prolonged periods often coming at more frequent intervals so that where previously the periods were of the 28 or 30 days type lasting 3-4 days, they now come every 2 or 3 weeks and last 7 to 10 days, and if the condition is allowed to continue and progress, the periods become practically continuous, and where the flow is profuse, marked symptoms of a severe secondary anemna appear so that in many cases extirpation of the uterus formerly had to be resorted to, to save life. Many of these cases give a history of one or more curettings over a number of years, the bleeding being controlled thereby for a longer or shorter period, and then recurring.

This condition occurs chiefly within the child-bearing period. It may develop shortly after the onset of menstruation, the so-called early or puberty bleeding, (2) during adolescence, (3) during the period of greatest reproduction activity (3rd and 4th dreads of life), and (4) is perhaps most commonly seen at the preclimacteric and climacteric periods, although occurring occasionally after the menopause is established.

Type of Subject

Concerning the physical findings in these cases, I have not been impressed that any particular type of woman is more prone to be afflicted than any others, the obese and the slight, the brunette and the blond, the highly neurotic and the calm phlegmatic types all appearing in about equal numbers. Rubin of New York feels that the neuropathic, visceroptotic type is more frequently associated with this condition, but although I have no definite figures it seems to me that the stalwart, broad chested type appears as often.

The local examination in the early case often reveals practically nothing to account for the bleeding. The corpus uteri may be within normal limits, may seem small, is perhaps most frequently a little large. In cases where the bleeding is of long duration the uterus is almost invariably large and of a tough dense consistency. The cervix may appear normal or may be the seat of the usual lacerations, erosions and degeneration to which the multiparous cervix is subject and which no one ever associates with bleeding. The uterus may be in good position or retroverted. The ovary shows little except some cystic degeneration of follicles as a rule, although in the puberty cases

*Read before the Providence Medical Association, June 7th, 1926.

there is a rather constant hypertrophy. The tubes are not palpable and appear to play no part in this condition. The endometrium may be abundant —moderate or normal in amount or scanty.

We may sum up the physical findings in these cases by saying that while anyone of the many pathological conditions to be found in the female pelvis during the reproductive period may be present, such as lacerations, erosions, cystic degeneration, malpositions, etc., that there is no one condition which is always present or characteristic of the condition.

If there is so little to be found on physical examination to account for such intractable and persistent bleeding, what do we know about this condition, what is its etiology and pathogenesis; does it arise as the direct result of local inflammation, or is there a more underlying factor to be sought for in the endocrine or sympathetic nervous system? Are the causes local or general?

Local Causes

The older writers focussed their attention on the *Myometrium* or on the uterine wall as the source of the disturbance, and had an inflammatory origin in mind. Scanzoni, 1860, described chronic metritis, finding that intractable hemorrhage was always secondary to an acute inflammation of the myometrium, describing a soft stage of hyperemia, infiltration and edema, and a hard stage of induration and fibrous replacement with increased brittleness of the arteries.

Theilhaber thought that there was an increase of connective tissue at the expense of muscle, causing an interference with the proper function of muscle in controlling the arteries and gave the name *uterine insufficiency*.

Anspach described the condition as *metrorrhagia myopathica*, finding that there was a failure in the normal increase in elastic tissue with excessive production of fibrous tissue making firm compression of uterus impossible, and thus causing disturbances in the endometrial circulation.

Goodall, 1910, believed that as women grow older, organs regenerate new tissues, especially blood vessels, less perfectly, there is more elastic or fibrous tissue replacement and less muscle regeneration, hence heaping up of fibrous tissue with loss of contractibility of vessels. Finds the removal of ovaries cures some milder cases because it reduces periodic congestion of periods, but where bleeding is profuse and metrorrhagia present does no good. Believes that the cause of the bleeding lies in the uterus and follows acute infection and subinvolution.

Polak in his Monograph on Pelvic Inflammation, 1922, describes fibrosis uteri, chronic metritis and subinvolution. He falls in with the older school believing that these conditions always result from inflammatory causes but believes in addition that there is a failure on the part of the endometrium to produce the proper ferments causing coagulation of blood.

Schickele and Keller in a very laborious piece of work in 1912, attempted to verify the findings of Theilhaber in regard to the part played by connective tissue in uterine bleeding. They took sections from the myometrium in a considerable number of extirpated uteri, stained them to show up the c. t. and projected the sections on millimeter paper. In this way a fairly accurate estimate of the relation of c. t. to muscle fibers was obtained. Their calculations led them to believe that uterine hemorrhage had nothing to do with the amount of c. t. present. Hemorrhage might be associated with hypertrophy of c. t., might occur with a perfectly normal amount of c. t., or might be entirely absent with a large overgrowth of c. t. (See Graves p. 58.)

Frank believes that inflammation is not a factor but that the fibrosis is due to ovarian hyperfunction.

2. *The Endometrium*

Before the work of Hitschman and Adler in 1908, the condition of *chronic endometritis* was often described as a cause of uterine bleeding and many changes in the uterine mucosa were described as evidences of inflammation, which we now recognize as usual phases of the menstrual cycle. It is now felt that a true inflammation of the endometrium is very rare outside puerperal or postaportal conditions. The uterine cavity is exceptionally well drained, and with the periodic congestion and throwing off of the superficial layers of the endometrium, infection is usually short lived. True evidences of inflammation as the plasma cell, the infiltration of leucocytes and lymphocytes are rarely seen. A condition of the endometrium was described in 1900, by Cullen as being present in a large number of these bleeding cases, and has

recently been again brought to the attention of the profession by Novak. These men note that grossly the endometrium in these bleeding cases may be greatly thickened or polypoid, sometimes even suggesting by the large bulk of tissue obtained in curetting the presence of malignant change. In some cases however they find that the endometrium is normal in amount, or even scanty, and that in some of the most intractable cases practically no endometrium can be obtained. Whether the endometrium is thick or scanty or normal in amount they find, however, on microscopical examination that there is a more or less typical appearance, a certain rather characteristic gland pattern, which consists in an overgrowth of the basal layer of glands and interstitial tissue with practical loss of the superficial layers usually found in the premenstrual or menstrual mucosa.

3. *The Ovary*

That the cause of pathological bleeding may lie in the ovary would seem entirely plausible in view of the undoubted relation that the ovary plays to normal physiological uterine hemorrhage. Without the presence of the ovary menstruation does not occur.

Whitehouse in 1914 demonstrated that there is evidently an enzyme or ferment which plays an important role in physiological and pathological hemorrhage. Whether this enzyme arises entirely from the ovary and is thrombolytic in character, accumulating in the endometrium until enough is present to cause degeneration of capillaries and solution of fibrinogen with resultant bleeding, or whether there is in addition another enzyme, as believed by Rubin, which arises in the corpus luteum and causes clotting, thus controlling hemorrhage, seems difficult to prove.

Many writers find the ovaries enlarged, especially in cases occurring during puberty and adolescence with cystic follicular degeneration and failure of corpus luteum formation. They find in this failure of a normal corpus luteum development the cause of the excessive bleeding, believing that the corpus luteum forms a blood clotting hormone necessary to the control of hemorrhage. That cystic changes are found rather frequently in these cases any surgeon of experience will attest. I have seen a fully developed corpus luteum in more than one ovary removed from a case of functional bleeding and there are numerous records in literature showing the presence of well developed corpus luteum in such cases.

Aside from this tendency to cystic degeneration of follicles there is no constant change in the gross or microscopic appearance of the ovary to account for the difficulty.

4. *The endocrine and sympathetic nervous system*

I have already referred to Rubin's theory that many of those cases arise in women of a neuropathic, vagotomic type, subjects of visceroptosis with hyperacidity and atony of stomach, obstipation, hypersecretion of salivary, sebaceous and sweat glands. He believes that the abnormal function of the ovary is merely a symptom of a generalized derangement of the sympathetic nervous system, or perhaps of the endocrine system as a whole.

That the endocrine system is at fault is borne out by the more frequent occurrence of this condition at puberty and at the menopause, when it is well recognized by all authorities that a general readjustment of the functions of these organs is going on, as shown by increased irritability, vaso motor disturbances, thyroid disturbances and all the commonly seen phenomena so peculiar to these periods of life. Also certain early cases yield to the administration of thyroid or pituitary gland extracts showing that there are factors concerned outside the pelvis.

In reviewing the material which has come under my observation at the Rhode Island Hospital on the radium service of the gynecological department in the last three years I have made the following generalizations:

(1) That in the early cases where the history of excessive bleeding was of short duration, little if any gross change in the pelvis organs was found except perhaps a thickening of the uterine mucosa, with the microscopic structure which approached that of the normal premenstrual phase.

(2) That where the bleeding had progressed for longer periods of time, fibrous changes appeared in the uterine walls with more or less enlargement, and that the endometrium took on the glandular appearance described by Cullen and Novak, i.e. an over growth of the basal type of gland with large dilated ducts lying side by side with small tubular ducts with increase of stromal cells (the Swiss cheese pattern).

(3) That with the very large boggy uterus found more particularly near the menopause the endometrium was most often very scanty, but what could be obtained showed the type described.

(4) That the ovaries which were available for study showed almost always some follicular degeneration but that corpus luteum was present in several.

(5) That no change which could be definitely called inflammatory was present in the uncomplicated case, except those changes in the cervix already noted as occurring in many women who never had any excessive bleeding.

I have then drawn certain conclusions from these studies for which I trust that you will bear with me, for we all realize that much work must be done before the last word as to the etiology and pathogenesis of this complicated condition is entirely clear.

(1) I believe that excessive uterine bleeding is primarily always the result of an ovarian endocrine disturbance initiated perhaps by any one of a number of factors that might apply to any gland of internal secretion.

(a) e. g. focal infections, cervicitis, etc., just as severe diseases of the other endocrine glands may be initiated by focal infections, thyroid disease from tonsils or teeth or pancreatic disease from gall bladder infections.

(b) Factors causing prolonged and continued pelvic congestion as excessive sexuality—frequent childbearing, repeated abortions.

(c) Circulatory failure due to heart disease.

(d) Developmental abnormalities.

(2) That the changes, found in the pelvic organs, are the reactions of those organs to excessive and continued congestion; results and not causes of the bleeding, except in the advanced stages, when permanent changes have occurred, and where the bleeding will continue even if the ovary is removed.

Treatment

With this conception of the etiology and pathogenesis of functional uterine hemorrhage the treatment becomes obvious.

(1) *General*

A thorough history and physical examination with the clearing up of possible foci of infection and an attempt to improve the bodily tone and resistance, rest in bed with foot elevated to relieve congestion in pelvis, *calcium* to replace the loss due to the continued bleeding, with exposure to the ultra violet light for its tonic and blood building properties.

(2) *Specific Organotherapy*

Organotheropy would seem to be the rational treatment and in some of the early cases different forms of ovarian extracts, thyroid, pituitary and combinations have proved successful in a limited number of cases, but have not as yet lived up to what should theoretically be expected of them.

(3) *Surgical Treatment*

Every case of uterine hemorrhage should be subjected to thorough dilatation and curettage to rule out malignant conditions and to allow of thorough pelvic examination for uterine or adnexal disease.

Curettage in itself seems to benefit the early case by destroying the hyperplastic endometrium and so controlling the bleeding, perhaps tiding the patient over until a proper readjustment of the endocrine takes place or the general sympathetic tone is restored, but in the case where the condition has gained momentum the bleeding usually rapidly recurs.

Hysterectomy was, up until a few years ago, the last resort, and extirpation of the uterus for this condition was not an uncommon termination of the condition, with of course satisfactory results.

(4) *Radiation*

With the advent of radium, a method of treatment has been found which has given most brilliant results. In no other field of therapy has radium proven to be of such definite value, and we may say that where radium in proper dosage fails to stop bleeding in this condition, that almost invariably malignancy of the body is present. Just how the radium acts is of course a matter of conjecture. I feel that its action is entirely local in the endometrium, resulting in atrophy or destruction of that organ and perhaps thus indirectly on the ovary. That there is any direct action on the ovary itself when the usual 1000 to 1200 mgh. dose is used seems improbable in view of the experiments of Schmitz. Of course in the puberty and adolescence cases and in the woman under 35 years of age great caution must be used and only the minimum dose necessary employed, but it seems to me preferable to use radium, than to do a hysterectomy on a young woman.

As you will agree, much work needs yet to be done before this important condition is clearly understood. I believe that the rational treatment of the future will be along proper hygienic lines with organ therapy. At present and until the intricate problem of the endocrines is better solved, radium can be relied on to give excellent results.

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The R. I. Medico-Legal Society—Last Thursday—January, April, June and October. Dr. Creighton W. Skelton President; Dr. Jacob S. Kelley, Secretary-Treasurer.

EDITORIALS

MUM IS NOT THE WORD

Silence for the doctor has ever been golden and a close mouth, the mark of a clever man—up to the present time only. Yet now, with so much changing in the field of medical practice, even this sheet anchor of proper conduct for the physician has become loosened. No longer can a man in the phrase of a local colleague constantly "say nothing but look darn mysterious" and get away with it. In the matter of his patient's private affairs silence to others is and ever will be his watchword. But when it comes to answering of the patient's many and reasonable questions as to the nature of his own complaints such a policy will no longer be tolerated. Public instruction in health matters has gone too far to allow it and the inference such an attitude advances. "I know, but you couldn't understand" is what we may call too "thin." As a cloak for ignorance, which it has always been, the policy of silence or evasion has become so threadbare and motheaten that the naked facts that it tries to cover is all too plain to the intelligent inquirer. No longer can we

glance at the tongue, look wise, write a prescription and go. We must explain and instruct. In point of fact the success of the treatment of many of the commoner ailments—as for example, tuberculosis and diabetes—depends more upon our ability as teachers of our patients than on anything else that we may do. To some of our older colleagues, reared in the days of mysteriousness and secrecy of which the present so-called Latin prescription writing is a vestige, the frank discussion and explanation seems new and strange—but like so much else it must be mastered if one is to do his duty. As we have less ignorance to hide we can discard the worn out cloak of secrecy and coming out into the open can frankly show our patients what knowledge has been won and what still awaits conquest.

INSTRUCTION IN ANESTHESIA

From the patient's standpoint, the anesthetic is the most important factor of a surgical operation. The physician who has considered anesthesia with the keen interest aroused by an operation impending on himself or some member of his family, knows how well founded is the patient's interest in the safety and comfort of undergoing anesthesia. Yet the medical profession as a whole is taking little interest in the subject. Few papers relating to anesthesia are read before surgical societies or printed in surgical journals. Competent instruction in anesthesia is not afforded by medical schools. An increasing number of hospitals are entrusting the administration of anesthetics entirely to unsupervised technicians. It follows that a graduate of a Grade A medical school and hospital may never have had a word of instruction about anesthesia nor have given a single anesthetic. It is true also that medical students are not anxious to become anesthetists, surgery being above all else their goal.

In defense, it is said that nurse technicians administer routine anesthesia better than does the average hospital interne and should be entrusted with this work for the benefit of the patients. If this defense be allowed, it must also be agreed that the nurse technician will administer routine anesthesia better than the medical graduate who has had no anesthetic training in school or hospital and that technicians rather than medical graduates should be chosen by surgeons for anesthesia in their private practice.

But of all the factors which go to make up successful surgery, anesthesia is of first importance. Some member of the surgical team must be conversant with the advantages and limitations, the indications, and the immediate and after effects of the various forms of general and regional anesthesia. If a medical graduate with special experience in anesthesia is not available, the surgeon himself must have a knowledge of anesthesia, which the present regime has offered him no opportunity to acquire. A few hospitals, whose authorities have realized the importance of providing training in anesthesia for internes, bring our only hope for maintaining as satisfactory a surgical anesthesia as there is at present or for future improvement. At the Rhode Island Hospital, every interne is required to administer general anesthesia for several hundred operations. Visiting anesthetists, who are staff members of the hospital, give practical instruction in anesthesia in the operating rooms and a course of lectures, illustrated with many lantern slides, on the theory of general and regional anesthesia. This instruction is given in January, April, July and October, the months when internes begin their work in administering anesthetics in the operating rooms.

Each interne must learn the rudiments of surgical anesthesia and has an opportunity to master the entire subject and to become a skilled anesthetist if he develops an interest in the work. This plan of instruction has attracted attention in other centers. It offers a hope for future advancement in anesthesia.

WHAT PRICE CULTURE ?

Is the physician losing ground culturally? In the not distant past the clergyman, physician, and lawyer represented the intellectual aristocracy of the community. However it may be with the other professions, it is only too apparent that such is no longer the case with our own. Undoubtedly this is in part due to the rise in the general level of education. The tremendous extension of the boundaries of medical knowledge is also a factor to be considered in extenuation. It is not now possible

for one man to master the whole of medical science. Even to keep reasonably in touch with the advances in one specialty takes so much time and energy that there is little surplus left for purely cultural development. As a result it is rare to find a physician who can converse well on any subject outside his immediate professional interest.

This means a loss both to the physician and the community. The man who has no interest outside his trade or profession is poor indeed. He misses that inward satisfaction which comes from the full use of all his faculties. As a practical point, he will be a better physician for a broader background.

Most of us wish and expect to die in harness, but if it be willed otherwise, then the latter years will be a burden indeed, if we have no resources within ourselves and no interests outside of medicine.

AN UNUSUAL CASE OF TUBERCULOUS MENINGITIS*

By Roy W. Benton, M.D.
Providence, R. I.

Tuberculous meningitis often presents a fairly definite clinical picture, and diagnosis in a hospital should not be unduly difficult. This case is reported because it has several unusual features.

The history was misleading in suggesting the possibility of a head injury as the cause. Three convulsions occurred ten to two days before entrance to the hospital, but on admission no reflex changes were apparent. Choked discs developed under observation without the accompaniment of vomiting or convulsions. The von Pirquet and intradermal tests were both negative over a week before death. The protocol follows.

D— L— a white girl about 8 years of age was apparently well until two weeks before entry to the Providence City Hospital when she was struck on the left side of the head by a stone. Her mother said the girl was not knocked down. A swelling appeared at the site of injury About four days later, the child suddenly vomited and after 9 hours was seized with a convulsion involving the left side of the face and body. Twitching of the left side and frothing at the mouth were reported. Duration two hours. On recovery the child seemed normal Three days later, that is seven days before entrance, a second convulsion occurred lasting fifteen minutes. The left side of the body was involved again. No frothing at the mouth. After the attack, the girl was not drowsy but complained of pain in the back preventing sleep. Two days before entrance, a third convulsion in which the child fell to the floor and was unconscious for about fifteen minutes. No sphincter disturbances reported. Afterward she complained of headache for several hours.

This story of convulsions occurring on the left side suggested the possibility of some brain injury from the blow on the head. The interval—about four days—was, to be sure, rather long, but DaCosta, for instance, says that after the rupture of a small cerebral vessel, the lucid interval may be hours or days and there may be no sign of bruise on the scalp.

At admission to the City Hospital, physical examination showed a fairly well developed and nourished girl about eight years of age lying quietly in bed. The only complaint was stomachache. She seemed somewhat listless. Temperature 99.6°, pulse 55, respirations 26. The only positive findings were: impacted cerumen in both auditory canals, slightly injected fauces without exudate, sinus arrhythmia with a faint apical systolic cardiac murmur, reddened vulva with a suspicious discharge. The reflexes were normal. Nothing found to show a cause for convulsions.

The second day, the patient slept most of the time but was easily roused and rational. Temperature varied from 99° to 101°. Pulse was constantly slow—58 to 66.

Within 48 hours after entrance the fundi were examined and some haziness of the disc margins noted. Physiological cupping was not seen but there was no elevation of the disc. The veins were full and the arteries more tortuous than normal. Lumbar puncture was done and yielded a clear fluid after the first few drops which were bloody. The pressure was apparently decreased. Spinal fluid sugar was 18.7 milligrams per 100 cubic centimeters. A cell count was not done because of the blood.

The fourth day, the child was drowsy, irritable when aroused but perfectly rational. Definite ab-

*Read before the Providence Medical Association April 5th, 1926.

normal neurological findings were reported. The neck was stiff, and Kernig, positive on both sides. Pulse remained below 70 and temperature not over 100.5°.

The seventh day, the drowsiness was marked and the patient mumbled incoherently at times. Nystagmus was noted on the left and the Babinski and Kernig were both positive on the left side.

The eighth day the von Pirquet test, then 72 hours old, was negative, and an intradermal tuberculin test was done. The patient's drowsiness, semi-comatose condition was the chief characteristic and the suspicion of tuberculous meningitis became stronger. Neurologically, the left lower extremity was flaccid, and knee and ankle jerks were absent. Babinski's sign was suggestive on the left; positive on the right. Abnormal and arm reflexes were not obtained on either side. The Brudzinski test was positive. Tache cérébrale was marked. A transient internal strabismus of the left eye was noticed.

The ophthalmoscope now showed the optic discs to be very hazy in outline, vessels embedded and the cupping gone. An elevation of about 2 diopters was present. The retina was essentially normal; no tubercules were seen. Lumbar puncture yielded 20 c. c. of clear fluid under markedly increased pressure. Globulin positive. Sugar 13.8 mg. per 100 c. c. Cell count was 220 chiefly lymphocytes. No organisms seen.

The tenth day, the neurological consultant found choking of both discs more marked on the right, left internal strabismus, bilateral Babinski and Kernig, left knee jerk absent; right active. The spinal fluid pressure was 34 mm. Hg. Cell count 200, mostly lymphocytes. Spinal fluid sugar 35 mg. per 100 c.c. The intradermal test was then negative after 48 hours.

The general condition of the patient remained about the same. She was semi-comatose and had to be fed with a spoon supplemented by rectal fluids. The temperature reached 103° on the ninth day, then dropped only to rise on the fourteenth day. The pulse averaged 100 between the eighth and the fourteenth day. The diagnosis was definitely settled for the first time on the twelfth day when tubercle bacilli were found in the spinal fluid.

About the fifteenth day, signs of broncho-pneumonia appeared on the right and on the left sides accompanied by a rise in temperature to 103° and pulse of 140. The patient remained unconscious until death on the sixteenth day.

At autopsy, the brain weighed 1081 grams. The cortical vessels were injected. The base was covered with a white film which extended up the left fissure. Direct smears from this film showed tubercle bacilli, mostly intracellular. The lungs showed a small area of broncho-pneumonia on the right at the base of the upper lobe and on the left a small area of firm consistency in the upper lobe. Microscopically there was no evidence of tuberculosis except on the brain and meninges. The guinea pig inoculated with spinal fluid from the second tap died in five weeks from tuberculosis.

W. L. Kinnear reporting on 100 cases of tuberculous meningitis in children (Lancet: Jan. 3, 1925) calls attention to the following features often present before or on admission to the hospital:

Paralysis, twitching or spasticity confined to one limb or side, presence of Babinski or Kernig, abdominal reflexes or knee jerks, on one side only, chart showing an irregular moderately raised temperature and a varying pulse rate, constipation in spite of cathartics.

He found vomiting, constipation or headache (children over 2 years of age) in over three quarters of the cases on entrance, and stiff neck and positive Kernig in over 50%. Convulsions were reported in 29%. Only ten percent of his cases were between the ages of 5 and 10.

This case is unusual and interesting because of:

1. The history of trauma two weeks before entrance.

2. The story of three definite left sided convulsions with normal condition following.

3. The absence of abnormal reflexes on admission with such a history.

4. The constancy of the neurological findings after entrance—diminished reflexes on the left with Babinski and Kernig positive.

5. The development of choked discs in a few days without occurrence of convulsions or vomiting.

6. The negative von Pirquet and intradermal tests before the patient became moribund.

NOTE

From Obituary Record of Yale Graduates

(Through the courtesy of Dr. C. H. Leonard)

Franklin Maynard Eaton

of Providence

Elected to Fellowship Rhode Island Medical Society June 9, 1887; removed from the state in 1896.

Born February 23, 1860, in St. Stephen, New Brunswick. Died November 22, 1925, in Calais, Maine.

Father, Henry Franklin Eaton, son of Jonas and Mary (Corey) Eaton; ancestors came from England to Watertown, Mass., in 1636.

Mother, Anna Louisa (Boardman) Eaton, daughter of William and Esther Wigglesworth (Tappan) Boardman; ancestors came from Yorkshire, England, to Newburyport, Mass., in 1637.

Phillips-Andover Academy, 1878. A. B., Yale, 1882. Member Class Crew; captain Freshman Football Team; Member University Football Team four years (captain senior year) * * * * *

M. D., Harvard 1885; house officer at Worcester (Mass.) City Hospital April-November, 1885; spent next year abroad continuing medical studies in Vienna for several months; after his return to this country practiced in Providence, R. I., for ten years; surgical externe Rhode Island Hospital April-December, 1887; surgeon to Out-Patient Department 1889-1896; physician to Providence Dispensary 1887-1889; Home for Aged Women 1890-1896, and Society for the Prevention of Cruelty to Children 1889-1896; member of examining board, Rhode Island Medical Society, 1890-1895; president Delta Kappa Epsilon Alumni Association of Rhode Island 1888-1890; had lived in Calais since 1896. * * * Member of Providence Medical Society, and Congregational Church, Calais. * * *

Death due to heart failure; had been an invalid over thirty years. Buried in Eaton family lot, St. Stephen, New Brunswick.

SOCIETIES

Pawtucket, Medical Association

The regular monthly meeting of the Pawtucket Medical Association was held at the "Jack O'Lanter" 33 Summer St., Pawtucket, October 21st, 1926, at 8:45 P. M.

The Association voted to support the plan for Medical Relief in disaster as arranged by the American Medical Association.

The death of Dr. John R. Venick was announced and a committee consisting of Drs. George Howe, Earl Kelly and Frank Lutz was appointed to draw up suitable resolutions on his death.

Dr. Roland Hammond of Providence was speaker of the evening and gave a most interesting talk, "Fractures." Collation followed.

Lester J. Gilroy, M.D.
Secretary

HOSPITALS

The Memorial Hospital

Pawtucket, R. I.

The following is a report of the Memorial Hospital Staff Meeting held October 7, 1926:

"Meeting called to order by President Wheaton at 9:15 P. M. Attendance record recorded in book.

Report of Secretary was read and approved.

Surgical report read by Dr. Jones.

Deaths

Dr. Hammond explained death of Osteomyelitis due to Septicaemia. Dr. Jones explained case of Intestinal Obstruction. Ruptured Gall Bladder, patient died of Surgical Shock. Dr. Wheaton explained one death due to Nephritis and Arterio Sclerosis.

No reports of special note from Out Paitent Department.

Bill presented for mailing matter was turned over to the Treasurer for payment.

Report of Resolution Committee presented by Dr. Hammond and accepted.

A letter from Mrs. Charles O. Read, acknowledging receipt of resolution, was read and placed on file.

Dr. F. V. Hussey read a very interesting paper on "Breast Cancer." Paper brought out the modes of metasteses in these cases. He quoted some French authorities on autopsy findings.

Possibilities of embolus but found that blood itself is very resistant against cancer cells and that they become thrombotic and are finally killed off. Deep fascia lymphatic plexi are responsible for cancer dissemination. Body divided into four lymphatic areas. These plexi drain into glands depending upon which area involved.

In addition there are deeper vessels which coalesce with deep plexi and also aid in dissemination. In development of cancer the medium lymphatic vessels are first involved. The larger lymphatic vessels sweep cancer cells along to forming embolus and are destroyed. This formation of lymphatics occurs early.

In this paper Dr. Hussey brought out the reason why we get some queer form of metastases.

Paper discussed by Drs. A. T. Jones, E. H. Wing, J. F. Kenney and I. Gerber.

Dr. Hussey closed discussion by explaining difference between lymphatic and circulatory dissemination.

Meeting adjourned at 10:30 P. M."

JOHN F. KENNEY, M.D.
Secretary, Memorial Hospital Staff

ANNOUNCEMENT

It is announced that beginning with the January 1927, issue *The Radiological Review* will be published monthly instead of bi-monthly and it will increase its number of pages from 32 to 64.

RADIOLOGY REVIEW PUBLISHING CO.
ROBERT H. SHERRICK
Business Manager

BOOK REVIEWS

AN INTRODUCTION TO OBJECTIVE PSYCHOPATHOLOGY

By G. V. Hamilton, M.D.
Publ. C. V. Mosby Co., 1925

This book attempts with much initiative and originality to put psychopathology on a foundation of fact rather than upon that of a Freudian phantasy. Besides being valuable and idea stimulating, it well fulfills its chief aim in isolating and demonstrating a few important types of situations to which the nervous patient often responds abnormally. Part I, which deals with case histories mostly sexual and with a brief survey of their findings, can be profitably avoided. Part II discusses the principles of objective psychopathology as deduced from the preceding histories and from animal experimentation. It also gives concrete advice in dealing with baffling disadvantage, and types and tabulates exceptionally well, reactions to it. The advantages of adjustive rational reactions and the dangers of persistent, non-adjustive, infractional, affective reactions are clearly described and much stressed.

During disadvantage with an emergency reactive value, the author conceives the autonomic nervous system as causing a special distribution of energy which results in emotion and interference with vegetative functions. If a situation of a feeble emergency reactive value recurs frequently, the responses of the autonomic nervous system are apt to be subacute, non-adjustive, and much prolonged. Reactions determined by a rational elaboration of experience do not involve autonomic functioning very importantly and so do not result in nervousness. This original and inspiring concept I consider the most important contribution which Hamilton makes to psychopathology.

OLD AND NEW VIEWPOINTS IN PSYCHOLOGY

By Knight Dunlap
Publ. C. V. Mosby Co., 1925

This book consists of five well written, readable essays on subjects of current interest in psychology. The essay on "Mental Measurements" is exceptionally good. In it the author stresses the fact that an adult with a grade of 12 on the Binet-Simon scale has not actually the mental characteristics of a child of 12 years, since the Binet-Simon intelligence tests, developed and standardized for pre-adult groups, do not measure the diverse lines of mental acquisition in adults.

Under "Present Day Schools of Psychology" the fact that psycho-analysis is based on "idea psychology," the ideas being not merely mental furniture but entities which exert force, is clearly brought out, as is also the development of the unconscious mind from these idea entities which are assumed to exist and exert force even when they are not observed by introspection.

The definition of instinct psychologically as the hereditary basis of predisposed reactions to certain

stimulations is in keeping with the modern trend in psychology. Following this conception, we agree with the author in considering all action as based on instincts and modified by intelligence; intelligence, of course, meaning the modification of the instincts through experience.

To the specialist in nervous and mental diseases, the criticism of psycho-analysis is valuable; to the average physician, the evaluation of the Binet-Simon tests is most instructive. For light, easy reading on a hot summer's day the book can be highly recommended.

SYMPTOMS OF VISCERAL DISEASE

Pottenger. Third Edition.
C. V. Mosby Co., Publishers.

The present is the third edition of this work, the first edition of which appeared in 1919. The nature of the work is not so well shown by the title as by the sub-title, which is: "A Study of the Vegetative Nervous System in its Relationship to Clinical Medicine." Part I is a résumé of our knowledge up to the present of the anatomy and physiology of the vegetative nervous system and touches briefly on endocrinology in its relationship to the former. The present edition contains as an addition to the previous edition, a chapter on "The Relation of the Ionic Content and Physical State of the Cell to Activity and Nerve Stimulation." Parts II and III discuss the manifold relationship of activity of the vegetative nervous system to symptoms of disease largely through reflexes which the author classifies as (1) viscero-motor, (2) viscero-sensory, and (3) viscero-trophic. This clinical treatise is based on the observations of the author and other well-known workers in this branch of medicine. For the internist, the surgeon, and the neurologist, a knowledge of the facts presented adds to the interest of their work and makes for a better understanding of the processes concerned in both health and disease in general. The book is well worth reading and having on hand for reference, and as a specimen of the book-maker's art, is to be commended.

MISCELLANEOUS

PREPARATION OF POTENT VASODILATIN-FREE PANCREATIC SECRETIN

An easy method of preparing a highly active pancreatic secretin solution ("new secretin") has been developed by M. M. Weaver, A. B. Luckhardt and F. C. Koch, Chicago, (*Journal A. M. A.*, Aug. 28, 1926). Under proper conditions of preparation, such a solution may contain only a minute amount of vasodilatin. The pancreatic secretin from this new secretin solution can be precipitated (with extraneous material) by means of sodium chloride, the vasodilatin fraction remaining essentially in the filtrate. Resolution in water and reprecipitation with sodium chloride lead to a further purification. Under certain conditions the active hormone can be washed from the precipitate, with the result that the hormone is free from vasodilatins. "Old secretin," prepared by the method of Bayliss and Starling, is not so susceptible to separation of the vasodilatin from the secretin by sodium chloride. The preparations of "new secretin" which yield the smallest amount of vasodilatin are those which are made in vivo. Those made in mortuo are best prepared immediately on death of the animal. A second method of selective adsorption to acidified permutit is uncertain and incomparably inferior in our hands with the precipitation by means of sodium chloride. "New secretin" preparations made in vivo or in mortuo remain active for months (even without a preservative), particularly if they are boiled (to destroy most bacteria and enzymes). The sodium chloride precipitate offers an excellent starting point for the ultimate isolation of the active principle in pure form.

HIGH JEJUNOSTOMY IN INTESTINAL OBSTRUCTION

In a series of experiments on dogs, Thomas G. Orr and Russell L. Haden, Kansas City, Kan. (*Journal A. M. A.*, Aug. 28, 1926), have studied the effect of jejunostomy on the chemical changes of the blood and the length of life following high obstruction of the jejunum. Also combined jejunostomy and treatment with sodium

chloride was studied. Obstructions were produced under ether anesthesia by sectioning the intestine from 10 to 12 inches below the liagment of Treitz and inverting the cut ends with purse string sutures. All secondary jejunostomies were done under local anesthesia; 0.5 per cent procaine was used. The technic of jejunostomy was a modified Witzel operation with an omental covering sutured over the rea. A small rubber tube was used, and in every instance the drainage through the tube was prompt and continuous. Water was permitted by mouth ad libitum. Blood for analysis was withdrawn daily from the jugular vein until the death of the animal. The nonprotein nitrogen, urea nitrogen, chlorides and carbon dioxide combining power were studied. Any animal showing a complication at necropsy was rejected. Five animals with simple obstruction of the jejunum lived from five to nineteen days. The chemical changes of the blood were similar to those noted in duodenal obstruction, but developed less rapidly. The carbon dioxide combining power showed an increase, but not the marked rise observed in obstruction of the duodenum and pylorus. In a second series of five animals in which obstruction of the jejunum and jejunostomy were done simultaneously, the length of life varied from three to five days. The chemical changes of the blood developed rapidly, and were typical of those found in high intestinal obstruction. Animals subjected to obstruction of the jejunum and jejunostomy simultaneously and treated with sodium chloride solution from the beginning of the experiment lived from three to twelve days. They did not show the chemical changes in the blood characteristic of jejunal obstruction. The administration of sodium chloride solution apparently prevented such changes. In five dogs with obstruction of the jejunum, jejunostomy was done after the development of a toxemia. The duration of life in the group varied from four to thirteen days. The animals developed the characteristic blood changes of simple jejunal obstruction. In the next series of five dogs, jejunostomy was done after the onset of the toxemia of jejunal obstruction. Sodium chloride was given after jejunostomy in sufficient quantity to keep the blood chlorides within normal limits. These animals did not develop the chemical changes of the blood characteristic of obstruction of the jejunum, and lived from thirteen to eighteen days. It was found in these experiments that animals having obstruction of the jejunum and jejunostomy together lived a shorter time than those having obstruction alone. This suggested the study of the effect of simple jejunostomy with the interesting observation that six dogs lived only from two to five days following the operation. All of these dogs showed a decrease in the blood chlorides and a rapid rise in urea and nonprotein nitrogen. With the well known danger of duodenal fistula and the rapid death of animals following experimental jejunostomy in mind, Orr and Haden believe that the clinical value of jejunal drainage for obstruction of the small intestine is yet to be proved.

FLUOROSCOPIC VISUALIZATION OF TUBAL PERISTALSIS IN WOMEN

Lipiodol was used by I. C. Rubin and A. J. Bendick, New York (*Journal A. M. A.*, Aug. 28, 1926), as the medium for study of women with tubal obstruction as previously demonstrated by gas insufflation. Not only were roentgenograms taken of the tubes, but direct fluoroscopic observation made it possible to watch the fluid in the uterus and tubes. It was thus possible to note also whether peristalsis was present. Twenty-six patients were observed. With the exception of two cases, 5 cc. of the fluid was sufficient to fill the uterine cavity and the tubes to full length. In two cases the uterine cavity held more than 5 cc., and the quantity used was double. The results of the examination in the first two of the twenty-six cases were not clear, but they were useful in indicating points in technic to which special attention had to be paid in subsequent cases. The present report is based on data obtained in the remaining twenty-four cases. Of these, seven were blocked close to the uterine wall. In seventeen cases, one or both tubes were visualized. Fifteen of these showed peristalsis which could actually be watched under the fluoroscope and evidence obtained on the films by the distinct beading which Dyroff descibed as "pearls." The lipiodol has been either removed by aspiration, or the little that remained in the uterine cavity was found to escape almost immediately after the cannula was removed. In the tubes the lipiodol may remain a fairly long time if the obstruction at any point is complete or only partial. This is especially true when cystic dilatation of the tubes is present. In a few cases, the lipiodol was seen lodged in the tubes several months after the injection, but no symptoms referable to its presence were noted.

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